Ghana

Estimating the Cost of Logistics in the Ministry of Health Supply System

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FPLM

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The Family Planning Logistics Management (FPLM) project is funded by the Office of Population of the Bureau for Global Programs, Field Support and Research of the U.S. Agency for International Development (USAID). The agency's Contraceptives and Logistics Management Division provides a centralized system for contraceptive procurement, maintains a database on commodity assistance, and supports a program for contraceptive logistics management.

Implemented by John Snow, Inc. (JSI) (contract no. CCP-C-00-95-00028-00), and subcontractors (The Futures Group International and the Program for Appropriate Technology in Health [PATH]), the FPLM project works to ensure the continuous supply of high-quality health and family planning products in developing countries. FPLM also provides technical management and analysis of two USAID databases, the contraceptive procurement and shipping database (NEWVERN), and the Population, Health, and Nutrition Projects Database (PPD).

Recommended Citation
Huff-Rousselle, Maggie, and Sangeeta Raja. 2002. *Ghana: Estimating the Cost of Logistics in the Ministry of Health Supply System*. Arlington, Va.: Family Planning Logistics Management (FPLM)/John Snow, Inc., for the U.S. Agency for International Development.

Abstract
This document summarizes a study that estimated the costs of the Ghana Ministry of Health (MOH) logistics system, including essential drugs, non-drug commodities, and contraceptives supplied throughout the public sector. The key findings suggest that (a) the MOH should address the issue of private sector procurement at every level of the system; (b) transportation costs at the service delivery point level are both very high and much higher than they should be in an efficient system; (c) storage is the largest cost for the supply system and should be a target for cost reduction; and (d) there is a disconnect between costs and what should be cost drivers, which indicates several possible problems that should be explored further. The unusual participatory learning approach used for the data collection in this study undermined the quality of quantitative data collected, but those working in the logistics system were involved in a way that should have increased their understanding of logistics system costs.


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Acronyms

CBD	community-based distribution
CMS	Central Medical Stores
CPR	contraceptive prevalence rate
DHMT	District Health Management Team
DMS	District Medical Stores
FPLM	Family Planning Logistics Management
GSS	Ghana Statistical Service
HIV	human immunodeficiency virus
JSI	John Snow, Inc.
LMD	Logistics Management Division
MI	Macro International Inc.
MOH	Ministry of Health
NDC	non-drug commodities
PLA	participatory learning approach
RDF	revolving drug fund
RMS	Regional Medical Stores
SDP	service delivery point
USAID	U.S. Agency for International Development

Exchange Rate and Currency

All currency is expressed in thousands of Cedis.

The average exchange rate for the Cedi in 1999 (based on average monthly exchange rates) was 2,765 Cedis for U.S.$1.

Acknowledgements

Although I am the principal author of this document, I was not involved in the design or implementation of the study that I have described and analyzed here. Sangeeta Raja, who was responsible for managing the study, and I would like to thank the many people who were involved with this study.

Thanks to the vision of USAID/Washington Contraceptive Logistics Management Division—especially Mark Rilling and Lisa Luschinger—for supporting the basic ideas behind the study. We are also grateful to Mr. Lawrence Darko and Kirk Lazell of USAID/Ghana for assisting with the administrative tasks related to the study.

The collaboration and support of the Ministry of Health staff in Ghana was central to conducting the study. Special thanks to Mr. Samuel Boateng, Director of Stores, Supplies & Drug Management Division and all his staff for their dedication and input during the development and implementation phase, and special thanks to all the data collectors whose fieldwork provided the basic data. We are also grateful to the Reproductive Health Division, especially Ms. Assan, for providing all the family planning data for analysis.

Many of the staff at FPLM also provided contributions as the project progressed. These include Rich Owens, Anthony Hudgins, Gary Steel, Carolyn Hart, Kieran McGregor, Linda Allain, John Durgavich, and Barbara Felling. Finally, last but far from least, we would like to thank Norbert Pehe for working with us tirelessly to analyze and crosscheck the data.

Maggie Huff-Rousselle

Executive Summary

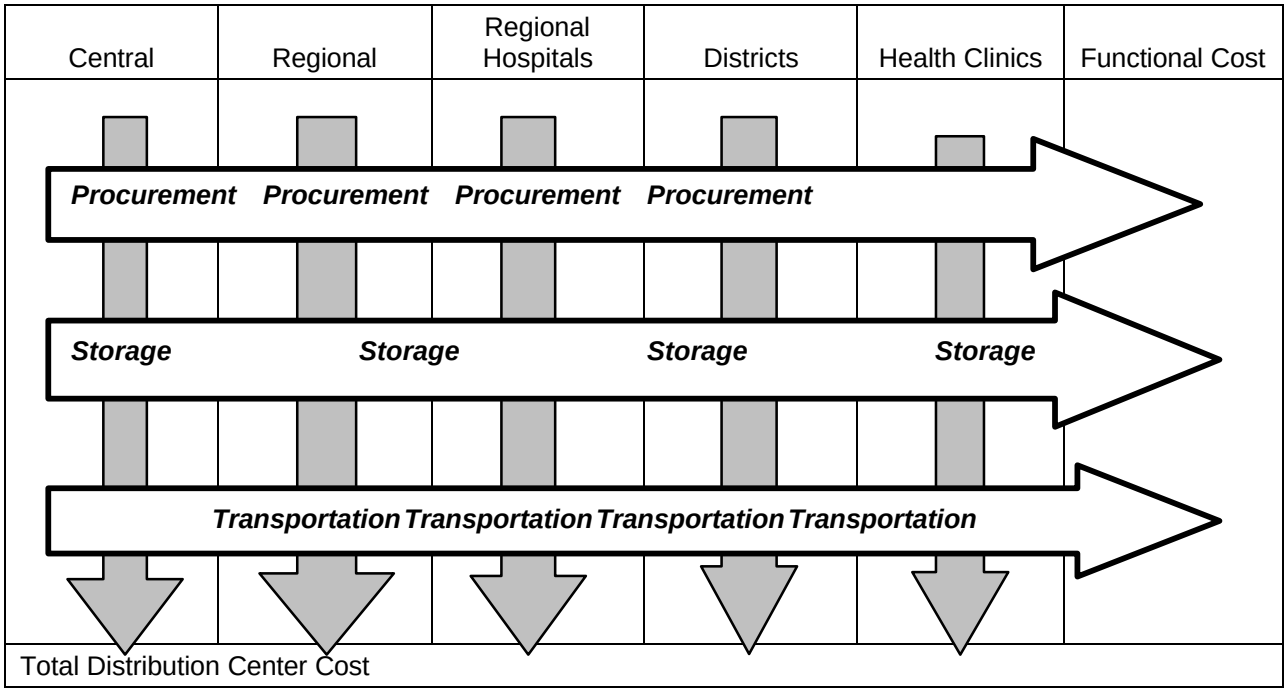
This document summarizes a study that estimated the costs of the Ghana Ministry of Health (MOH) logistics system, including essential drugs, non-drug commodities, and contraceptives supplied throughout the public sector. The costs of the MOH's vaccine cold chain, which operates independently, were not included in this study. A study of cold chain costs was conducted recently, and the relatively close timing of the two studies should make them more useful to the MOH.

This study is unusual for two reasons:

This is the first time Ghana has studied the costs of logistics in the public health sector, and cost studies of logistics in the public sector at the national level are almost unheard of, with the exception of those analyzing cold chain supply systems for vaccines. This study estimated the costs of supply chain management as a discrete function within the MOH. It segregated estimated costs for specific facilities operating in different tiers in the system and for three functional areas of logistics: procurement, storage, and transportation.

For the highest levels of the system, the Central Medical Stores (CMS) and the 10 Regional Medical Stores (RMS), total system costs have been projected and compared with programmatic indicators, such as population served or the value of commodities procured. For the lower levels, the District Medical Stores (DMS), regional and teaching hospitals, and other service delivery points, the sample size was too small to project total system costs with any degree of confidence, so data from these facilities are only used illustratively (see figure 1).

Figure 1.
Framework for Costing of Supply System



Second, the study adapted and incorporated a participatory learning approach (PLA) as central part of its methodology. While PLA has recently gained popularity as a qualitative research methodology, it is generally not part of the tool kit of quantitative researchers or of financial analysts. The PLA involved key staff at different levels of the MOH logistics system in the study process. Fifteen MOH staff who were responsible for managing the RMS were the "surveyors" responsible for data collection in facilities in six regions.

Although accountants and financial staff were also involved, much of the work and thinking about how to study the costs of the logistics system came from staff working in the system. They became stakeholders in the study process—reviewing and revising the study design and the data collected at different points in time—and in the validity of its results. Both their interest and confidence in the study results increased because of their involvement, and they are more likely to accept and use the findings to make strategic and tactical decisions. The approach was, however, unlikely to have achieved as much accuracy as would have been obtained from a more conventional approach. However, a unique aspect of this study is that the final figures represent what those professionals operating the logistics system believe the costs of their system to be.

In addition to the costs of operating the logistics system, the value of the commodities that flowed through the upper tiers of the system during 1999 were also estimated, including approximately 650 drugs, more than 800 non-drug consumables, and ten contraceptives. Data on the value of commodities procured by CMS (through both international tenders and local procurement) and from CMS by the RMS facilities are robust. The value of commodities procured by the RMS level and other facilities from the private sector could not be estimated with the same precision. The study team was aware that, overall, from 50 to 60 percent of pharmaceutical and non-drug commodities were being purchased on the local private sector. However, the proportion purchased by individual facilities probably varied significantly from the overall average.

This issue, along with others, led to the following key findings:

- The MOH should address the issue of private sector procurement. These procurements typically represent higher unit costs, a reduction in preventive quality assurance measures, and a greater risk of overstocks (and therefore expiration) for stock at the CMS level.
- The high proportion of total procurement costs attributable to the RMS level suggests that the decentralized procurement from the private sector is also increasing the costs of operating the supply system. Procurement directly from CMS should be more cost-effective both in terms of the cost of procurement activities and in terms of the unit prices paid for commodities.
- Public sector prices may sometimes be higher than private sector prices in Ghana, particularly at the wholesale level. This unconventional situation is a result of the combined effect of CMS buying from private sector wholesalers—who are in a real sense the competition for CMS—and then marking up the prices with a margin that is higher than a typical wholesale margin.
- It is clear that transportation costs at the service delivery point level are both very high and much higher than they should be in an efficient system. The MOH should consider alternatives to the transport methods currently being used throughout the system, as transportation costs are also not rational at other levels of the system.
- Storage is the largest cost for the supply system, representing 73 percent of total supply system costs for the CMS, RMS, and DMS level. Therefore, cost-containment efforts should focus on this function, and consideration should be given to eliminating some of the facilities in these tiers, particularly the DMS tier.
- There is no logical relation between the operating costs of a facility and either the population served or the value of commodity throughput at the RMS level. Neither commodity throughput nor service population appear to drive operating costs, as they should in an efficient and rationally operated system.

- The lack of a connection between costs and what should be cost drivers might indicate inefficiencies, a lack of incentives to perform efficiently, or a budgeting process that is not linked to service population or throughput. These discrepancies between facility operating costs should be explored further.

The analysis in the report discusses these issues, a variety of suggested cost containment initiatives, possible avenues for privatization, and areas for further study.

This study was conducted by the Ghana MOH in collaboration with the USAID-funded Family Planning Logistics Management (FPLM) project. The FPLM project has provided a variety of technical assistance to the MOH over the past few years, and this work is now being continued under the follow-on DELIVER project.

1. Introduction and Background

Why are the costs of commodities important? Why are the costs of their procurement, storage, and transport important? Why should such costs be analyzed?

Next to personnel, pharmaceuticals and contraceptives represent the largest cost item in most health budgets. Their manufacture is generally controlled by multinationals, and their importation requires foreign exchange that is too often scarce. This makes their procurement a tempting target for lucrative under-the-table arrangements at every level of the health system.

If pharmaceuticals and contraceptives are not available, staff working in the health system can accomplish little or nothing, and client confidence in the system erodes. Yet supply systems frequently function in haphazard and irrational ways, with overstocks that result in spoilage or expiration and stockouts that result in health system failures.

Consumers are more willing to pay for pharmaceuticals than for any other component of health services. This fact makes these commodities a primary target for the introduction or increase of user fees to generate health sector revenues.

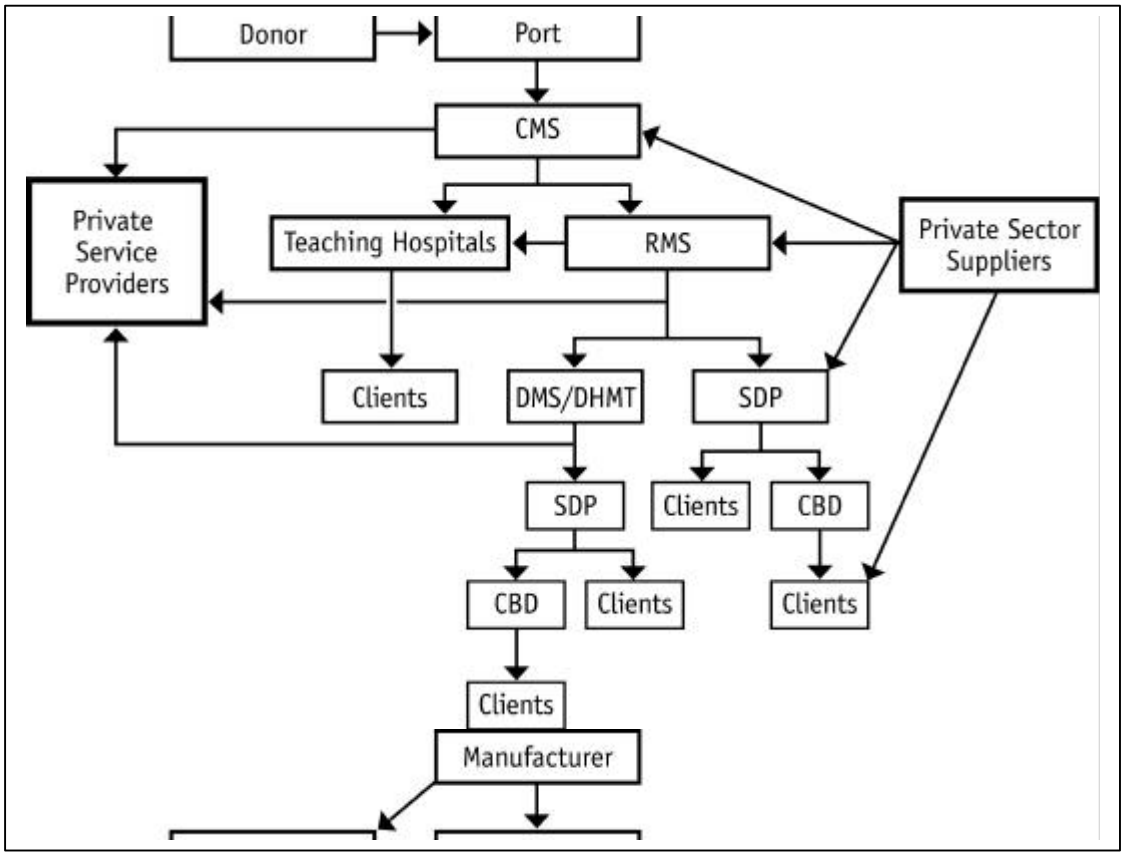
These facts are both universally relevant and specifically relevant to Ghana. Despite the critical importance of pharmaceuticals, contraceptives, and non-drug commodities, the actual costs of these commodities and the revenues they generate are rarely analyzed. The cost efficiency and cost effectiveness of the supply system—the costs of procuring, storing, and transporting commodities—are almost never analyzed.

Figure 2 is a diagram of the Ghana MOH logistics system. Commodities are purchased by Central Medical Stores (CMS) through both competitive international procurement and local private sector procurement. The 10 Regional Medical Stores (RMS), two teaching hospitals, and four regional hospitals procure commodities both from CMS and directly from the local private sector. The 20 District Medical Stores (DMS) procure from the RMS level (and occasionally from the private sector). In addition to the larger teaching hospitals and regional hospitals, 900 service delivery points (SDP) are supplied by either and RMS or a DMS. These SDPs, which range from small hospitals to very basic health centers, may also procure commodities directly from the private sector, although the proportions of private sector procurements are very limited at this level. A small percentage of the drug and non-drug consumables are donor-funded (about 2 percent) while the bulk of the contraceptives are donor-funded. (Future support for contraceptives is expected to come through a World Bank loan.)

Revolving drug funds, at the individual facility level, operate throughout Ghana's public health delivery sector. Nearly 38 percent of the total revenues earned within the MOH system during 1999 were drug revenues. This compares with nearly 16 percent for consultations, 7.4 percent for accommodation, and 5.9 percent for laboratory fees.[1] The revolving drug fund (RDF) concept also operates at the upper levels of the supply system, and mark-ups over the basic unit purchase price of commodities are added at the CMS level and other tiers in the system as the commodities move down through the pipeline.

[1] Source for revenue statistics: Ministry of Health Financial Report. 31 December 1999.

Figure 2.
Ghana Health Commodity Delivery System



2. Major Findings and Their Implications

Cost of Commodities: Throughput and Purchase Prices

Data on the value of stock that moved through the system was collected on approximately 650 drugs, more than 800 non-drug consumables, and 10 contraceptives at the CMS and RMS level. The value of commodities procured by CMS and the value of commodities procured from CMS by each of the RMS facilities were used in this study as proportionally representative of the value of commodities that flowed through these facilities. Commodity values for CMS included both international tenders and purchases from the local private sector. Accurate figures for CMS issues to the RMS facilities were available, but accurate figures for purchases from the local private sector from the RMS level were not available. Therefore, we increased the value of the CMS issues to the RMS level to account for the fact that a large portion of the RMS commodities came from the private sector. Since the 1998 baseline study had found that private sector purchases represented 45 percent of the RMS level stock, we used this proportion to increase the commodity throughput values across all RMS facilities.

One of the most striking observations from this study is that from 50 to 60 percent of the pharmaceuticals and non-drug commodities were purchased directly through the private sector at various levels of the public system. This estimate is based on discussions with those working in the system, including CMS staff, [2] because other facilities—DMS, hospitals, and other SDPs—also purchased commodities from the private sector. This means that the collective proportion of supplies purchased in the private sector increased beyond 50 or 60 percent as commodities progressed down the pipeline, and more commodities were incrementally purchased from the private sector.

This situation would normally result in three problems:

- Higher unit purchase costs for commodities (and probably increased under-the-table arrangements for purchasing at all levels).
- Reduced ability to ensure quality through preventive measures.
- Greater risk of expiration at higher levels of the systems, especially CMS.

Unit Purchase Costs

MOH logistics staff working on the study estimated that commodities purchased in the private sector cost from 40 to 50 percent more, per unit, than they would if they had been procured through CMS. In most other contexts, this level of price differential would be expected between the private sector and public sector. This estimate of the proportional increase in purchase costs for private sector purchases is, again, based on discussions with those working in the system, including CMS staff. Although their opinions were considered well founded, a quantitative follow-up study at selected sites is recommended. Such a study is particularly important because the combination of private sector purchases at the CMS level and public sector pricing margin policies appear to be making public sector prices higher for some products—perhaps many products.

Decentralization of procurements—which is happening—should be viewed with caution. At the central level, good procurement mechanisms that ensure both highly competitive prices and reasonable quality can be implemented (assuming there is political will), partly because of the volume of commodities being

[2] Throughout this report when figures were estimated without the benefit of quantifiable source data, the estimates were based on the informed judgement of the logistics professionals working in the MOH system. They discussed the issues and came to a consensus. Their judgment is usually backed up by other sources. In this case, for example, the Baseline Study on The Ghana Pharmaceutical Sector in Ghana found that 45 percent of RMS's purchases were from the private sector in 1998, a statistic that generally supports the estimates cited for this study.

purchased and partly because of the complex administration needed to operate such mechanisms. Screening, pre-selection, and monitoring of the performance of suppliers can prevent quality assurance problems from happening, rather than simply identifying them when they have already happened.

By contrast, at lower levels, decentralization can encourage nepotism (Kolehmainen-Aitken 1999) and temptations for under-the-table procurement arrangements. Competitive information on price and quality are scarce. Given the lower volume and lack of information, those procuring at lower levels of the system have little negotiating power. Staff at these levels will also spend more time and resources when procuring products from the private sector than they would in procuring directly from CMS. The process will normally be inefficient because of the relatively lower volumes.

Basic unit purchase costs are generally the most critical costs in the supply system, because everything else builds on them. If unit purchase costs are 40 to 50 percent higher than they need to be, then not only do the products consumed by clients cost the system 40 to 50 percent more but the value of commodities lost, stolen, damaged, or expired is also inflated by 40 to 50 percent. The capital invested in the commodity supply pipeline—the value of all commodities in the supply system—is also inflated, increasing the opportunity cost of capital to the government, as this capital could have been invested elsewhere if it had not been tied up in the pipeline.[3]

Ministry of Health Pricing Policies

Contrary to both conventional wisdom and the beliefs of the logistics staff who worked on this study, public sector prices may sometimes be higher than private sector prices in Ghana, particularly at the wholesale level. This unconventional situation is the result of the combined effect of CMS buying from private sector wholesalers—who are the competition for CMS—and then marking up the prices with a margin that is higher than a typical wholesale margin.

The 1998 Baseline Study gave the reasons for public sector facilities purchasing from the private sector, in order of their importance: (1) non-availability at medical stores, (2) convenience, and (3) lower prices. Only two of the 17 public sector facilities surveyed cited lower prices as the reason for private sector purchases. By contrast, seven of the 14 mission facilities surveyed gave lower prices as their reason for purchasing from the private sector rather than CMS. Managers of mission facilities probably have price-sensitive shopping habits and tend to compare public and private sector sources of supply more carefully than those working in the public sector, who either assume that the public sector prices are lower or that they are obligated to buy from their own system.

Contrary to conventional economic theory and business practice, pricing policies and practices in the MOH system tend to provide higher margins at the higher levels of the system. This means that the levels with a higher volume of throughput, where operating costs in relationship to throughput should be lower, relative to other levels, have a high mark-up; while facilities with a lower volume have a lower mark-up. This is the reverse of typical private sector pricing where wholesale margins would be lower because of economies of scale and more price-aware clients, and retail margins would be higher.

Evidence from the 1998 baseline suggests that the MOH prices are higher for those purchasing wholesale—who will be more informed price sensitive shoppers—and lower than more private sector alternatives at the retail level. The combination of CMS purchases from the private sector and CMS pricing margin policies are apt to be encouraging private sector purchasing at other levels of the MOH system.

[3] See glossary for definitions of this and other terms explained for this study.

Levels of Wasted Stock

Although the survey team collected data on stock in the system that needed to be destroyed (e.g., expired and damaged), this information could not be used in estimating wastage rates for 1999 because such stocks had been accumulating over a period of years. This is a typical problem in systems where there are complex bureaucratic procedures associated with the disposal of such stock.

However, the very low stock turnover rates suggest that stock loss through wastage and expiration will be very high and that, overall, the system is overstocked. This is discussed below.

Total Logistics System Costs

The total costs of the public sector logistics system for 1999 were estimated at 54,331,621 thousand Cedis, using the sampled facilities at each level and projecting costs based on the number of facilities at each level of the system. In estimating these costs, the MOH logistics staff included only the direct costs of logistics—both operating costs and amortized capital costs—and not MOH system costs that could be indirectly associated with logistics. They did not include indirect costs associated with personnel or the costs of the indirect support the supply system receives from the MOH for general and administrative activities, training, etc. This suggests that the direct costs of the logistics system were more than 13 percent of MOH expenditures, which were 397,701,242 thousand Cedis during 1999.

However, we have eliminated projected costs for the smaller SDPs and large hospitals from most of our analysis, for three reasons. First, the sample for the smaller SDPs was too small to make projections with a good degree of confidence. Second, the costs at the smaller SDPs and hospitals would be unlikely to change significantly based on any changes in the commodity supply system, as most activity at the SDP level involves managing individual items in the inventory and dispensing those items to patients. Third, many of the costs at this level are arguably more closely linked to direct service provision than to the supply system.

Transportation costs, however, represent a major exception to the second and third points made above. The transportation costs projected at the SDP level are 3,892,669 thousand Cedis. If transportation costs projected at the regional hospital level (308,826 thousand Cedis) and the teaching hospital level (255,240 thousand Cedis) are added to the SDP level, the transportation costs for levels below the CMS/RMS/DMS level are 4,456,735. This means that the total transportation costs at these lower levels is almost equivalent to the total costs of all functions—procurement, storage, and transportation—at the three upper levels of the supply system. The high projected transportation costs at the lower levels of the system appear to result from the inefficient ways in which transportation in the system is currently arranged, and this topic is discussed in the section on functional costs and transportation.

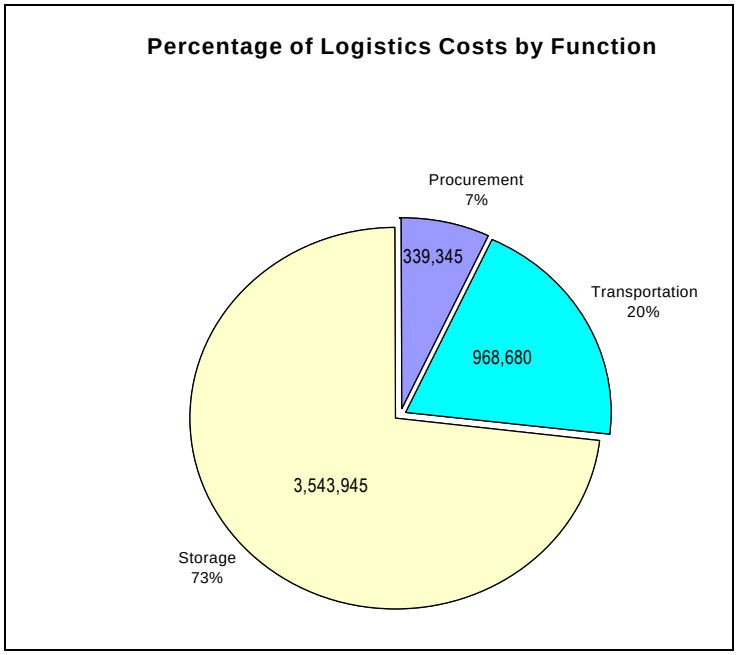
Since the SDPs are numerous (approximately 900 smaller facilities) and they are dealing with individual items of inventory rather than bulk stock and warehousing, the costs at these levels are substantial. When these costs are removed from the projections, total system costs at the level of CMS, RMS, DMS, teaching hospitals, and regional hospitals are 7,517,509 thousand Cedis, or just under two percent (1.89 percent) of MOH expenditures. If the hospitals are eliminated from the projections, the total direct costs of the logistics system are 4,851,970 thousand Cedis or 1.2 percent of MOH expenditures.

The costs, by function, for each tier are illustrated in the following figures and tables.

Costs by Major Functions

When we limit the analysis to the levels that are exclusively supply system facilities (without the SDPs or hospitals), the system costs divided by the three major functions are 339,345 thousand Cedis or 7 percent for procurement; 968,680 thousand Cedis or 20 percent for transportation; and 3,543,945 Cedis or 73 percent for storage. Storage is responsible for the largest share of the costs, followed by transportation, which together represent more than 90 percent of total functional costs (see figure 3).

Figure 3.
CMS, RMS, and DMS Costs by Function



The proportional costs for each function vary depending on the level of the system, and are discussed below under the functional headings (see tables 1 and 2).

Table 1. Percentage of Tier Costs by Function

	CMS (%)	RMS (%)	DMS (%)	Total (%)
Procurement	41	41	18	100
Transportation	33	41	27	100
Storage	19	68	13	100

Table 2. Percentage of Functional Costs by Tier

	Procurement (%)	Transportation (%)	Storage (%)	Total (%)
CMS	12.20	27.65	60.16	100
RMS	4.73	13.39	81.87	100
DMS	7.86	33.43	58.71	100

Procurement

Procurement included all arrangements for replenishment of stock, regardless of source. Costs for procurement by CMS and costs for procurement from CMS at the various tiers of the system are merged with the costs for procurement from the private sector at the various levels. However, procurement from the private sector should have taken more time and resources at the tiers below CMS than it would have taken them to procure directly from CMS. Procurement costs also include the cost of ordering, while costs related to inventory control and the LMIS were included in storage.

The risks of allowing significant procurement at levels of the system below CMS were discussed earlier. The 1998 baseline study found that 45 percent of RMS level commodities were being purchased in the private sector. The relatively high portion of procurement costs attributable to the RMS level suggests that the actual costs of procurement have increased (with the level of unit purchase costs) as a result of the degree of private sector purchasing that is taking place. Procurement from CMS should be more cost effective both in terms of the unit prices paid for commodities and the cost of procurement functions.

Except for CMS, where one would expect a high proportion for procurement costs, procurement represents the lowest functional costs at every tier in the system. Procurement costs can be expected to rise with an increase in the number of sites procuring and the number of procurements made. (The volume of commodities being procured for a single procurement should not have a significant impact on the costs of procurement.) Procurement cannot be privatized at lower levels of the system and it would not be advisable to privatize procurement at the central level as it is essentially a natural monopoly. (If, however, “privatization” is interpreted as a state-controlled enterprise, then the same arguments do not apply.)

Transportation

Transportation costs included direct costs for labor, depreciation of vehicles and garage equipment, fuel and other operating costs for vehicles, and hiring of private transport. Labor and amortization, or depreciation of buildings and equipment, were treated as fixed costs, while other internal MOH operating costs, with the hiring of private transport, were treated as variable.

To the extent that facilities in the system are paying for private transport, the transport function is already being contracted to the private sector. As with procurement at lower levels of the system, this is probably happening without the benefit of competitive shopping that would ensure low costs. On the other hand, managing drivers, vehicles and (sometimes) garages for maintenance within the MOH system may be more expensive than contracting out to the private sector. Scheduling of transport operated by the MOH may result in vehicles and drivers not being used at full capacity, depending on how often and when deliveries are being scheduled. Any excess capacity or less than optimal scheduling of transport would also make in-house MOH transportation less cost efficient.

Given data available through this study and the limitations of the MOH in-house transportation system, we can only speculate on the efficiency or inefficiency of the MOH’s in-house transportation system. Of the six RMS facilities sampled, for example, 53 percent of one facility's transportation costs were for privately contracted transport, and it was the RMS facility that had the lowest transport costs in relation to the value of the commodities it procured. On the other hand, the RMS facility with the next highest proportion (23

percent) of transport costs expended on privately contracted transport had the highest transport costs in relation to the value of commodities it procured. There also appears to be no relationship between costs and the distance to be traveled between a RMS and the CMS (see table 3).

Table 3. Transport Costs for Six Regional Medical Stores
(in thousands of Cedis)

Regions	Total Transportation Costs	Private Contracted	MOH Transport	% Private	Distance KM to CMS	Throughput
RMS, Ashanti	196,864	1,200	195,664	1%	272	1,456,424,752
RMS, Central	15,189	8,000	7,189	53%	165	808,111,308
RMS, Greater Accra	126,901	1,000	125,901	1%	25	1,393,678,105
RMS, Upper East	214,821	48,504	166,317	23%	815	566,314,474
RMS, Upper West	105,846	8,200	97,646	8%	721	487,306,396
RMS, Western Region	56,036	2,250	53,786	4%	229	1,119,225,662

A major barrier to evaluating the MOH supply system's internal transportation costs is that the MOH has little in the way of an in-house transportation system. Instead of contracting transportation out in a systematic way to maximize cost efficiency, through scheduling at the central and regional levels by a transport company (or MOH in-house vehicles), the responsibility for transportation is pushed down the system to the lower levels. This means that all 900 SDPs are arranging their own transportation for supplies, using taxis and public transportation or occasionally paying per diem and fuel costs for the level above to deliver to them. This is very inefficient system for arranging transportation.

The transportation system becomes even more inefficient when one considers that current procedures (as described in the recent process mapping study) can require three trips for a single delivery. For those facilities served by a DMS, they need to make separate trips to the RMS for non-drug commodities (NDC) and the DMS for pharmaceuticals, which again multiplies the number of trips required. Although we cannot have a high degree of confidence in the projected transportation costs at the SDP level, it is clear that transportation costs at this level are much higher than they should be in an efficient system. This is obvious from the sample of SDPs and relative transportation costs and common knowledge about how the system operates.

Following procurement costs, transportation costs are the next lowest of the three functional costs. They should vary based on the number of trips and the distance traveled. The volume of commodities being carried will also have some impact on transportation costs, but, in general, increasing the number of trips and the distance traveled should have a greater impact on transportation costs.

Storage

Storage costs include the amortized or depreciated value of buildings and equipment used in warehouses and storage spaces, utilities, and the cost of labor and materials (fuel, stationary, cleaning supplies, office supplies, etc.) used to manage stored inventory and the related logistics management information system (LMIS).

Privatization of storage in the facilities that are actually delivering services (i.e., teaching hospitals, regional hospitals, and other SDPs) is not feasible. Unless the MOH is concerned about controlling stock losses caused by a lack of competence or honesty in warehouse staff, it is unlikely that privatizing storage would be advisable at the other tiers. (If the MOH is concerned about leakage from the system, for which MOH staff are responsible, then privatization of the storage function might be an alternative strategy.) Storage costs can be expected to rise both with increases in volume beyond current capacity and with increases in the number of facilities providing storage. As discussed below, it is probably cost-effective for

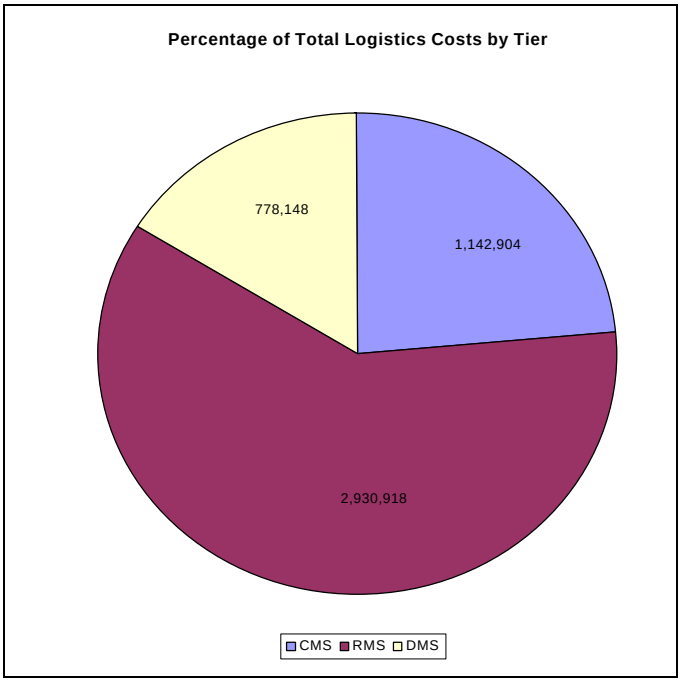
the MOH to remove the DMS facilities from the supply system, and possibly some RMS facilities, especially those close to CMS.

Storage is the largest cost for the supply system, representing 73 percent of total supply system costs for the CMS, RMS, and DMS level. Therefore, cost containment efforts should focus on this function, and consideration should be given to eliminating some of the facilities in these tiers, particularly the DMS tier.

Costs by Tiers

When we limit the analysis to the levels that are exclusively supply system facilities (without the SDPs or divided hospitals), the system costs by the three major tiers are 1,142,904 thousand Cedis or 24 percent for CMS; 2,930,918 thousand Cedis or 60 percent for RMS facilities; and 778,148 Cedis or 16 percent for DMS facilities. The RMS level is responsible for the largest share of the costs, followed by CMS, which together represent nearly 85 percent of total costs at these levels (see figure 4).

Figure 4.
CMS, RMS, and DMS Costs by Tier



Central Medical Stores Level

The CMS level is seen as having excess capacity and being less organized than it should be. If the CMS were better organized and transportation systems were improved, then the excess capacity could be exploited to streamline the system and reduce or allocate costs more rationally. In addition to organizing efficiently scheduled transportation (as discussed above), facilities at the DMS level could be eliminated and facilities at the RMS level might also be eliminated over time. This could reduce storage costs and reduce the pipeline, thereby reducing wastage and expiration.

Regional Medical Stores Level

When population statistics and the value of commodities are compared across the 10 regions, per capita expenditure appears erratic—from a low of 706 Cedis per capita to a high of 1,191 Cedis. [4] (See figures 5 and 6.)

Fluctuations in the proportion of commodities purchased in the private sector[5] from one region to the next might explain some degree of the variation across regions. However, the proportion of commodities purchased in the private sector is unlikely to explain much of the variation. Also, if non-availability of stock at CMS were the primary reason for private sector purchases, one would expect a relatively even distribution of private sector purchases across regions.

The large fluctuation in per capita expenditure is more likely to reflect inequities in access within the public sector or irregular leakage from the public supply system. This issue should be explored further as the variation exposed here identifies potential problems but not their underlying causes.

Figure 5.
Per Capita Commodity Expenditure at the RMS Level

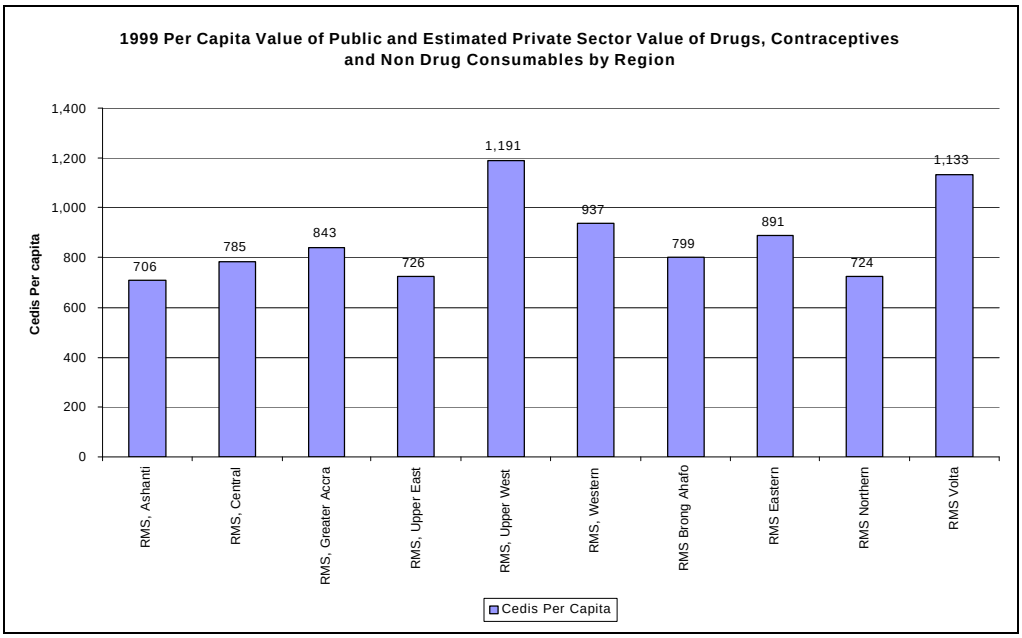
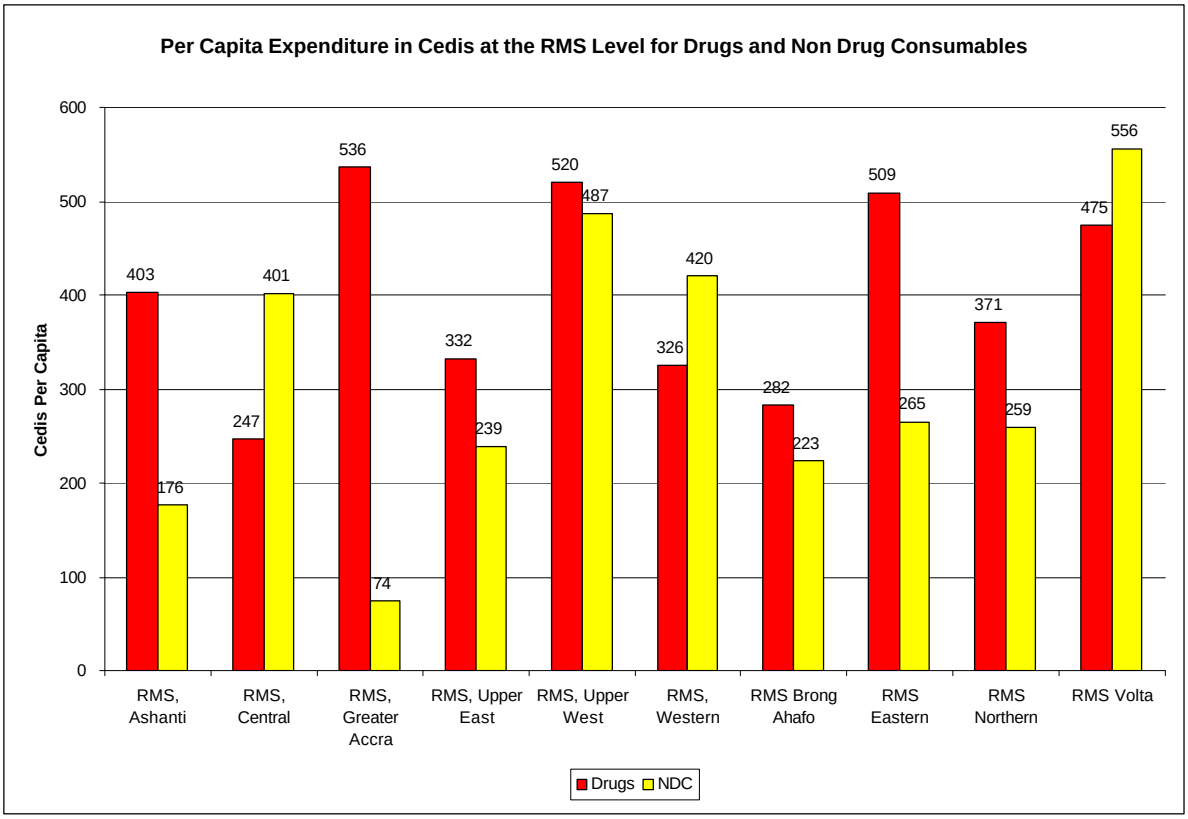


Figure 2.
Per Capita Expenditure for Drugs and NDC at RMS Level

[4] All population statistics were drawn from: Ghana Statistical Service (GSS) and Macro International Inc. (MI). 1999. Ghana Demographic and Health Survey 1998. Calverton, Maryland: GSS and MI.

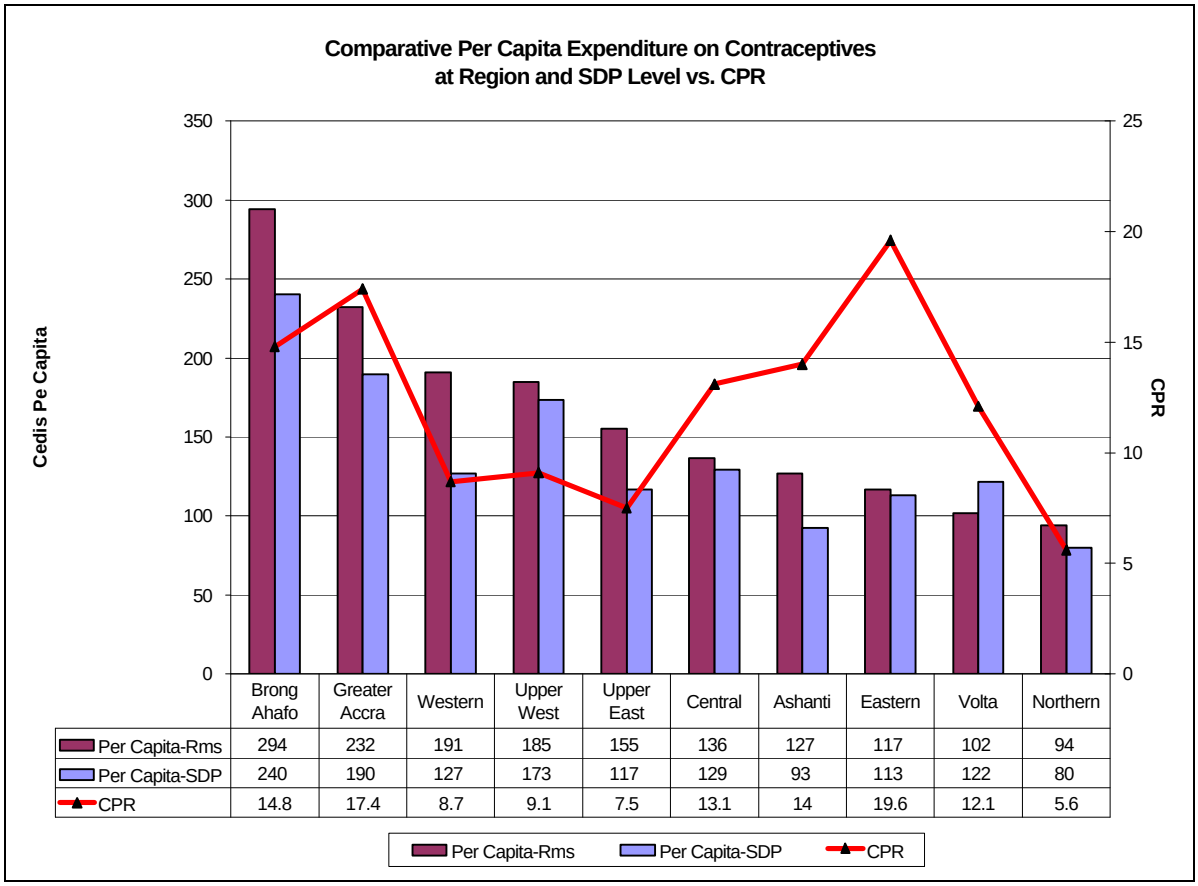
[5] As explained previously, a standard portion for private sector purchases was applied across all RMS facilities.



A similar, if less dramatic, pattern is revealed when the comparison is limited to contraceptives, for which data on the value of commodity throughput are considered very robust (see figure 7). For contraceptives, we calculated per capita expenditure and compared this with the contraceptive prevalence statistics for modern methods. Again, there is not a clear link between either per capita expenditure for contraceptives or the contraceptive prevalence rate (CPR) for modern methods and expenditure. For contraceptives, the RMS facilities do not make private sector purchases but individuals do. Nearly half the contraceptives purchased in Ghana come from the private sector. However, since we are looking at proportional comparisons, the differences are unlikely to be explained because some regions have much larger portions of the population buying from the private sector. Differences in method mix from one region to another might also explain the apparently erratic patterns across regions but, again, this is apt to provide a partial explanation at best. It is most likely that leakage out of the system or inappropriate stock levels underlie the large variance across regions.

These discrepancies between facilities should be explored further by taking this type of analysis down to the facility level and using patient visits rather than population as the numerator.

Figure 7.
CYP and Per Capita Contraceptive Expenditure at the RMS and SDP Level



	Brong Ahafo	Greater Accra	Western	Upper West	Upper East	Central	Ashanti	Eastern	Volta	Northern
Per Capita-Rms	294	232	191	185	155	136	127	117	102	94
Per Capita-SDP	240	190	127	173	117	129	93	113	122	80
CPR	14.8	17.4	8.7	9.1	7.5	13.1	14	19.6	12.1	5.6

District Medical Stores Level

Given what is seen to be overstocking of the whole system and the costs of operating the system, elimination of the DMS tiers in the system would—

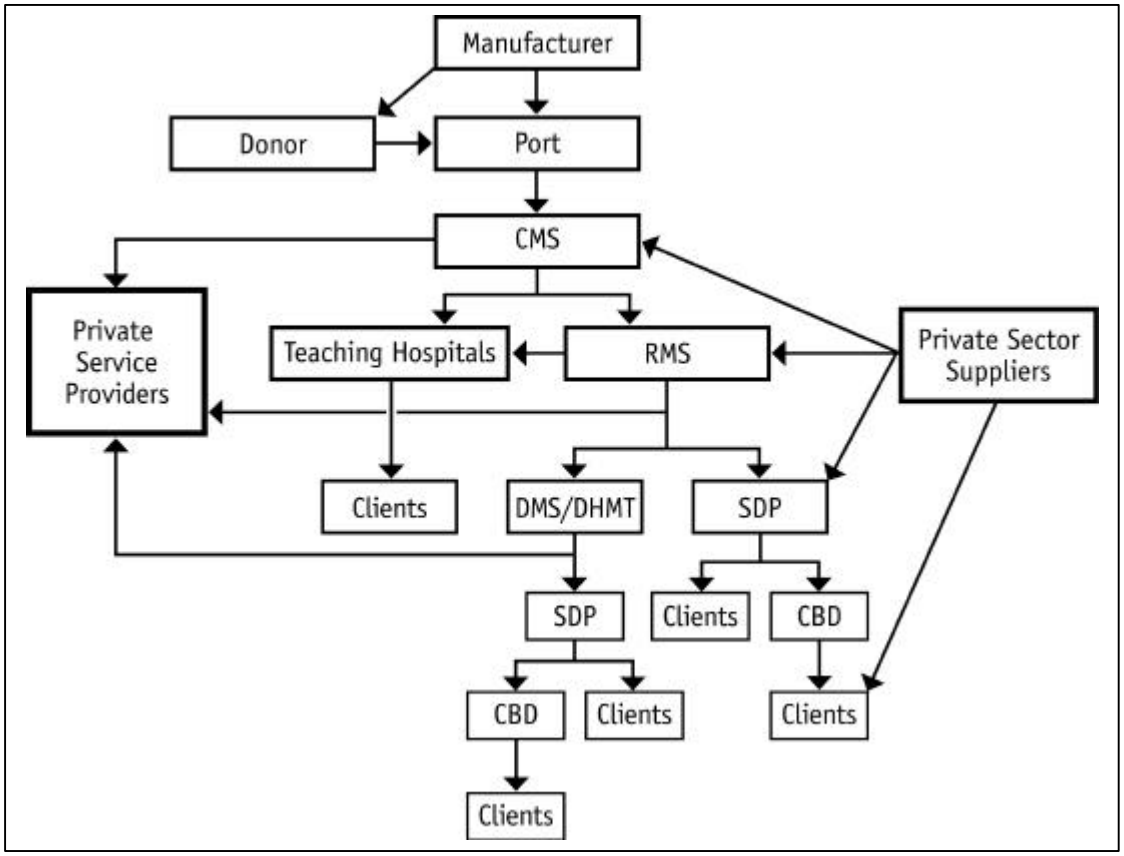
- Reduce the capital tied up in commodities.
- Reduce the risk of loss through expiration.
- Reduce the operating costs of the system.
- Simplify and streamline operations, management, and planning.

Since the DMS level facilities have very limited capacity and can handle only drugs and not the NDC, this means the SDPs have to go to both the DMS and the RMS or CMS for their supplies. This creates additional inefficiencies at other levels of the supply system but especially at the SDP level.

It may be wise to reduce DMS facilities gradually; in general, a too rapid or too radical approach to change will create more problems than it solves. Two or three districts could be selected and the facilities eliminated as part of a pilot. Careful selection criteria should be developed, based primarily on distances between a DMS and the RMS as compared with CMS, and the amount of storage capacity available. However, it may also be possible to eliminate the tier all at once if this is well planned.

The potential for reduction in system operating costs and in shortening the pipeline should also be carefully analyzed. The DMS level, as projected, for example, represents 16 percent of the total system costs above the SDP level and includes 20 facilities. The RMS represents 60 percent of total system costs and includes 10 facilities. All operating costs associated with the DMS or RMS level will not disappear if a level is eliminated or facilities in the level are eliminated. However, procurement costs associated with an additional tier should disappear and storage costs will be drastically reduced if there is sufficient storage capacity at the other levels. (In general, there appears to be excess capacity throughout the system.) Reducing the number of trips required should also reduce transportation costs and, as table 3 suggests, eliminating, at least, the Greater Accra RMS (which is very close to CMS) will reduce transportation costs at the RMS level.

Figure 8.
Ghana Health Commodity Delivery System



However, the potential benefits of eliminating a tier, as listed above, are not limited to the reduction of operating costs. The elimination of the RMS or DMS level will shorten the pipeline for all segments of the delivery system, except for those commodities that go directly to tertiary facilities (see figure 8). In addition to streamlining and simplifying operations, this should reduce the capital tied up in commodities and the risk of expiration. Elimination of a tier would also effectively be a form of decentralization, if handled appropriately.

As indicated, the supply system has very low inventory turnover rates throughout, and tightening the pipeline through elimination of tiers and facilities will reduce operating costs, reduce wastage through overstocking, and reduce the investment of capital in the pipeline.

Opportunities for Cost Containment

A number of initiatives that should contain costs were discussed earlier: obtaining better unit purchase prices; reducing pricing margins at the higher levels to increase sales and encouraging procurement through CMS; reorganizing the transportation system, either through formal private sector contracting or a rational public sector system; and removing a tier or facilities in a tier. A more detailed analysis of selected aspects of the system would pinpoint other potential areas for cost containment.

Privatization and Decentralization

Since the idea of privatization has gained popularity in recent years, the possibilities for—and potential pitfalls—related to privatization were discussed in the analysis earlier. Transportation, which is already effectively privatized, seems the most promising area for a more coherent, systematic approach that could reduce costs and improve effectiveness. This and other areas require further study.

In general, decentralization of the supply system should be viewed with caution. Although eliminating a tier or facilities in a tier may effectively help decentralize the system in a positive way, effectively decentralizing of the procurement function has made the system more expensive without obvious positive gains for the system.

Areas for Further Study

A number of areas for further study are suggested:

1. Conduct a study of the purchase price paid at various tiers and facilities for commodities purchased from the private sector versus products purchased from CMS. This study would assess procurement performance in terms of purchase prices, and help formulate policies about how to monitor and control decentralized procurement that is not cost-effective.

2. Conduct on-going information on prices, which could be useful to those responsible for private sector procurement by giving them negotiating power through competitive price information.

3. Conduct a study comparing the prices charged by the MOH system at various levels above the retail/service delivery level with the private sector. Note that this was already done at the retail level during the 1998 Baseline Study.

4. Solicit bids from the private sector or collect current costs from the private sector that would support projections on the costs of contracting out the transportation function systematically.

5. Select facilities at the RMS and DMS level and compare the operating costs with the value of throughput and the service population.

6. Use these indicators, with storage capacity and distance from CMS, to develop selection criteria for the elimination of facilities.

7. Review budgeting practices at the central level that might explain what appears to be an irrational relationship between supply system operating costs and throughput or service population.

3. Methodology

Key informant interviews and review of accounting and inventory records were the main data sources. For each of the sample sites, cost data were gathered on each separate logistics function: procurement, storage, and transportation. Data were also collected on the monetary value of throughput for each of the three categories of commodities: more than 800 non-drug consumables, approximately 650 drugs, and 10 contraceptives. The data gathered were validated and compiled, entered into spreadsheets and revalidated, then manipulated and analyzed. The results from the sample sites were used to project costs for the entire MOH system. The focus, however, was on the levels of the system that were dedicated to supply functions, rather than the levels where services were delivered.

Data Collection Instrument

The data collection instrument was designed by a team of seven people including logistics experts with international experience; an economist; and the Director of Stores, Supplies and Drug Management Division for the Government of Ghana. The instrument was initially organized by three major functional areas of the logistics system. Although the questions and categories of data in the original survey instrument were never changed, the survey form was later reorganized according to the types of people to be interviewed and the types of source data that would be used to facilitate data collection.

Participatory Learning Approach

Fifteen MOH staff members who were responsible for managing the RMS were recruited and trained in data collection. When these “surveyors” returned after an initial round of data collection, which took place over two months, other experts joined them in a series of working meetings and reviewed the data. The surveyors discussed the data, differences in data from different sites, and differences in data collected by different surveyors. Site visits were also made to validate the data. During a series of meetings the surveyors discussed the data sources, and the relationship between operations and costs at every level of the system, and their approach to data collection. These meetings were used as a participatory learning approach (PLA) to the study of costs. The approach was particularly effective in Ghana, where, as in most other West African countries, there is a culture of open debate and friendly disagreement. The surveyors then returned and conducted another round of data collection as a subset of the initial sites.

Decisions about what proportion of selected categories of costs should be attributed to the three functional areas—procurement, storage, and transportation—were made after extended debate between the surveyors who worked in the supply system. Thus, the construction of the assumptions used to attribute or allocate costs to the different functional areas, or to estimate total costs for all three functional areas, was based on an exchange of ideas and peer review by colleagues who had intimate familiarity with the systems operations. Through the PLA, the logistics system managers taught themselves how to do more precise and rigorous data collection, developed guidelines to ensure consistent methods of attributing costs, and developed their own thinking about how costs were driven within the logistics system.

As is usually the case with PLA, this approach was very time consuming. However, it was seen as more relevant than more traditional approaches to costing, which would have involved system participants in only a peripheral sense as interviewees. It was also felt to be as, or more, accurate than an approach relying primarily on financial analysts and staff from the MOH’s financial departments, because the RMS managers were reviewing and discussing the data at various stages.

Data Collection Sites

Sites were selected in Western, Cape Coast, Greater Accra, and Ashanti Regions. For upper tiers of the logistics system, the sites for data collection included CMS's, six of the 10 RMS's, one of the two teaching hospitals, and four of the 10 regional hospitals. Therefore, for each of the upper tiers, the surveyors collected data on from 40 to 100 percent of the facilities in the tier. This kind of sampling was not possible for the lower tiers, particularly the approximately 900 SDPs

.

4. What Financial Data Were Included?

Financial terms can be confusing because they are often used differently depending on the purpose and context of study and analysis, and many terms used to classify costs are not mutually exclusive. For the readers, a brief section defining selected financial terms is included at the end of this report. (See Glossary.)

Commodity Costs: Throughput

The study included the costs for all commodities procured by CMS during the year and the costs of commodities procured by the RMS level from CMS. Purchases from the private sector were based on estimates given both by the MOH staff working in the supply system and from the Baseline Study conducted in 1998. Commodity costs included purchase costs paid by the MOH and the value of donated or subsidized commodities that moved through the system during 1999. Unit cost data for drugs and non-drug commodities were drawn from issue slips at each level of the supply system. Since records for donated commodities were not as well kept as those for MOH purchases, the value of these donated commodities may be underestimated. For donated contraceptives, however, accurate data on quantities and unit costs for donations from UNFPA and USAID were available.

Capital Costs: Land and Buildings

The capital costs of land and buildings were estimated based on market value, and they were included only if those costs represented a direct cost for the supply system that was a marginal cost from the perspective of the rest of the MOH system. For example, if a building used by the supply system was a discrete entity that could be sold if it were no longer used for the supply system, it was included. However, if the supply system was only using part of a building, and the rest of the building was in use by the MOH, the capital value of that portion of the building was not included. Based on site visits, the study team decided that buildings and land at the level of the hospitals, DMS's, and SDP's was always used by the MOH for multiple purposes; therefore, capital costs for buildings were not included at these tiers of the supply system.

To include the cost of capital in the final annual cost estimates for 1999, the capital costs of buildings used in the system were amortized over 25 years. Therefore, one twenty-fifth of the capital costs for buildings used by the system became an operating cost.

Capital Costs: Vehicles and Equipment

The capital costs for other assets (i.e., vehicles and equipment) were estimated based on their replacement value. To convert capital costs to annual operating costs, the replacement value of each type of asset was depreciated over its estimated useful years of life, just as the value of the buildings was amortized. If the asset was not dedicated full time to the supply system, then the annual depreciation was multiplied by the percentage of time that it was dedicated to supply. Heavy equipment was depreciated over a 10-year period, while less robust equipment was depreciated over a five-year period.

Operating Costs: Personnel

Personnel costs were estimated by counting the number of staff, by position, working in the supply system at each location and multiplying the average salaries (and other forms of remuneration) for those positions by the percentage of their time the staff spent performing supply system tasks. The research

team decided that it was unlikely the MOH would eliminate or add staff positions based on changes in throughput.

Other Operating Costs

Other direct operating costs were calculated based on actual receipts for expenses, such as the hiring of private transport or on the proportional share, that should be assigned to the logistics system. For bills for utilities and communications, for example, a proportion of costs were assigned to the logistics system in facilities where those costs served multiple purposes. Costs for utilities and communications were treated as fixed operating costs. Other operating costs—fuel, stationary, cleaning supplies, office supplies, etc.—were considered variable costs but, from the results of the analysis, these costs did not appear to vary in relation to either throughput or service population.

Excluded Costs

Indirect costs—costs that were not incurred directly by the supply system—were excluded because the MOH would continue to bear the indirect costs whether of not it was responsible for pharmaceutical supply. Such costs included general and administrative costs at all levels of the system that were not dedicated exclusively to support of the logistics system. Training costs, even though the training might have been of some benefit to the logistics system, were also excluded because the research team felt that these costs would remain at the same levels even if the MOH were not responsible for the logistics system.

Appendix A
Cost Spreadsheets

Assumptions

GHANA PUBLIC SECTOR SUPPLY SYSTEM COSTING STUDY

Discount rate for land:	25	Depreciation for Heavy Equipment:	10
Amortization for buildings:	25	Depreciation for Other Equipment:	5
Private Sector Purchases	45%		

	Throughput by Level								
	Pharmaceuticals		Contraceptives	Non Drug Commodities					
	Public Purchase	Private Purchase		Public Purchase	Private Purchase	Sub-Total Public	Sub-Total Private	Total	Population
CMS	12,268,462,605	0	5,909,710,120	14,176,514,450	0			32,354,687,175	
Total CMS	12,268,462,605	0	5,909,710,120	14,176,514,450	0			32,354,687,175	
RMS, Ashanti	724,801,226	594,337,005	415,160,720	316,462,806	259,499,501	1,456,424,752	853,836,506	2,310,261,258	3,270,957
RMS, Central	222,750,045	182,655,037	223,724,800	361,636,463	296,541,900	808,111,308	479,196,937	1,287,308,245	1,640,135
RMS, Greater Accra	723,709,219	593,441,560	569,892,960	100,075,926	82,062,259	1,393,678,105	675,503,819	2,069,181,924	2,455,206
RMS, Upper East	220,592,534	180,885,878	187,197,920	158,524,020	129,989,696	566,314,474	310,875,574	877,190,048	1,208,006
RMS, Upper West	188,561,980	154,620,824	122,037,760	176,706,656	144,899,458	487,306,396	299,520,282	786,826,678	660,438
RMS, Western	333,518,944	273,485,534	355,274,400	430,432,318	352,954,501	1,119,225,662	626,440,035	1,745,665,697	1,863,165
RMS Brong Ahafo	312,952,457	256,621,015	594,095,840	247,171,966	202,681,012	1,154,220,263	459,302,027	1,613,522,290	2,018,798
RMS Eastern	720,278,641	590,628,486	300,624,480	374,796,238	307,332,915	1,395,699,359	897,961,401	2,293,660,760	2,575,224
RMS Northern	409,894,117	336,113,176	188,791,200	285,952,144	234,480,758	884,637,461	570,593,934	1,455,231,395	2,010,891
RMS Volta	460,102,746	377,284,252	179,406,240	538,742,875	441,769,158	1,178,251,861	819,053,409	1,997,305,270	1,763,315
	4,317,161,909	3,540,072,765	3,136,206,320	2,990,501,412	2,452,211,158	10,443,869,641	5,992,283,923	16,436,153,564	
Korlebu Teaching Hospital	236,488,731			832,447,855					
On'Anokye Teaching Hospital	153,434,058			190,960,047					
	389,922,789			1,023,407,902					

Procurement

GHANA PUBLIC SECTOR SUPPLY SYSTEM COSTING STUDY

	Procurement Costs by Level							
	Capital Costs		Recurrent Costs			Total Costs		
	Buildings	Equipment	Labor	Operating Costs	Handling	Capital	Recurrent	
CMS	10,661	139,800	48,000	41,000	35,387	150,461	124,387	
CMS Total	10,661	139,800	48,000	41,000	35,387	150,461	124,387	
CMS Level Recurrent	426	13,980	48,000	41,000	35,387	14,406	124,387	**139,393**
RMS, Ashanti	0	6,720	3,360	242	0	6,720	3,602	
RMS, Central	0	365	1,170	0	0	365	1,170	
RMS, Greater Accra	0	8,400	8,520	2,000	1,180	8,400	11,700	
RMS, Upper East	0	1,870	9,174	37,240	0	1,870	46,414	
RMS, Upper West (Wa)	0	21,670	5,712	2,173	0	21,670	7,885	
RMS, Western Region	0	12,950	1,296	0	0	12,950	1,296	
Total	0	51,975	35,232	41,655	1,180	51,975	78,067	
Annual Recurrent/Facility	0	866	5,872	6,943	197	866	13,011	
Regional Level Recurrent	0	8,663	58,720	69,425	1,967	8,663	130,112	**138,774**
Bekwai District Hospital	0	40	2,304	3,600	0	40	5,904	
Dodowa District	0	0	0	800	0	0	800	
Nsema East District	815	0	2,400	36	0	815	2,436	
Total	815	40	4,704	4,436	0	855	9,140	
Annual Recurrent/Facility	11	1	1,568	1,479	0	12	3,047	
District Level Recurrent	217	27	31,360	29,573	0	244	60,933	**61,177**
Wa Regional Hospital	0	896	6,248	50,250	0	896	56,498	
Bolga Regional Hospital	0	60	4,320	0	0	60	4,320	
Tema General Hospital	629	61,025	3,600	320	0	61,654	4,520	
Western Regional Hospital	5,256	1,060	7,181	2	0	6,316	7,183	
Total	5,885	63,041	21,349	51,172	0	68,926	72,521	
Annual Recurrent/Facility	59	1,576	5,337	12,793	0	1,635	18,130	
Regional Hospitals Recurrent	589	15,760	53,373	127,930	0	16,349	181,303	**197,651**
Komfo Teaching Hospital	0	10,940	3,840	8,760	0	10,940	12,600	
Total	0	10,940	3,840	8,760	0	10,940	12,600	
Annual Recurrent/Facility	0	1,094	3,840	8,760	0	1,094	12,600	
Teaching Hospitals Recurrent	0	2,188	7,680	17,520	0	2,188	25,200	**27,388**
Nsuto SDP	0	0	0	0	0	0	0	
La Polyclinic HC	629	8,250	1,200	720	0	8,879	1,920	
Dodowa HC	0	0	0	0	0	0	0	
Shama HC	0	0	1,920	0	0	0	1,920	
Fumbisi HC	0	50	1,230	0	0	50	1,230	
Sandema District Hospital	0	30	7,464	0	0	30	7,464	
Babile HC	0	0	480	0	0	0	480	
Lawra Hospital	0	26	1,593	1,817	0	26	3,410	
Total	629	8,356	13,887	2,537	0	8,985	16,424	
Annual Recurrent/Facility	3	104	1,736	317	0	108	2,053	
SDP Recurrent for System	2,831	94,005	1,562,288	285,413	0	96,836	1,847,700	**1,944,536**
						Total System Procurem		**2,508,920**
						Without SDPs		564,384

Transportation

GHANA PUBLIC SECTOR SUPPLY SYSTEM COSTING STUDY

Transportation Costs by Level

	Capital Costs				Recurrent Costs		Total Costs		
	Vehicles	**Garage**	**Equipment**	**Labor**	**Private Transport**	**Operating Costs**	**Capital**	**Recurrent**	**Total**
CMS	547,542	1,580,665	53,000	48,796	0	143,908	2,181,207	192,704	
Total	547,542	1,580,665	53,000	48,796	0	143,908	2,181,207	192,704	
CMS Level Recurrent	54,754	63,227	5,300	48,796	0	143,908	123,281	192,704	315,985
RMS, Greater Accra	98,961	???	0	2,798	1,000	24,142	98,961	27,940	126,901
RMS, Central	0	???	???	7,189	8,000	???	0	15,189	15,189
RMS, Western	34,360	12,648	0	3,783	2,250	2,995	47,008	9,028	56,036
RMS, Ashanti	159,008	???	0	3,636	1,200	33,020	159,008	37,856	196,864
RMS, Upper West	48,533	1,791	17,500	19,070	8,200	10,752	67,824	38,022	105,846
RMS, Upper East	29,933	118,269	3,600	4,525	48,504	9,990	151,802	63,019	214,821
Total	**370,795**	**132,708**	**21,100**	**41,001**	**69,154**	**80,899**	**524,603**	**191,054**	
Annual Recurrent/Facility	**6,180**	**885**	**352**	**6,834**	**11,526**	**13,483**	**7,416**	**31,842**	
Regional Level Recurrent	**61,799**	**8,847**	**3,517**	**68,335**	**115,257**	**134,832**	**74,163**	**318,423**	**392,586**
Bekwai District Hospital	162,782	0	0	190	0	15,942	162,782	16,132	
Dodowa District	19,911	0	0	769	200	2,890	19,911	3,859	
Nzema East District	0	0	0	0	0	756	0	756	
Total	**182,693**	**0**	**0**	**959**	**200**	**19,588**	**182,693**	**20,747**	
Annual Recurrent/Facility	**6,090**	**0**	**0**	**320**	**67**	**6,529**	**6,090**	**6,916**	
District Level Recurrent	**121,795**	**0**	**0**	**6,393**	**1,333**	**130,587**	**121,795**	**138,313**	**260,109**
Wa Regional Hospital	13,937	0	0	780	2,400	13,690	13,937	16,870	
Bolga Regional Hospital	30,100	0	0	9,612	0	18,214	30,100	27,826	
Tema General Hospital	169,240	0	0	4,691	40	41,210	169,240	45,941	
Western Regional Hospital	49,777	0	0	1,294	0	5,294	49,777	6,588	
Total	**263,054**	**0**	**0**	**16,377**	**2,440**	**78,408**	**263,054**	**97,225**	
Annual Recurrent/Facility	**6,576**	**0**	**0**	**4,094**	**610**	**19,602**	**6,576**	**24,306**	
Hospitals Recurrent	**65,764**	**0**	**0**	**40,943**	**6,100**	**196,020**	**65,764**	**243,063**	**308,826**
Komfo Teaching Hospital	287,698	0	0	4,296	0	94,554	287,698	98,850	
Total	**287,698**	**0**	**0**	**4,296**	**0**	**94,554**	**287,698**	**98,850**	
Annual Recurrent/Facility	**28,770**	**0**	**0**	**4,296**	**0**	**94,554**	**28,770**	**98,850**	
Hospitals Recurrent	**57,540**	**0**	**0**	**8,592**	**0**	**189,108**	**57,540**	**197,700**	**255,240**
Nsuto SDP	0	0	0	0	120	0	0	120	
La Polyclinic HC	44,799	0	0	401	0	10,471	44,799	10,872	
Dodowa HC	0	0	0	0	210	240	0	450	
Shama HC	0	0	0	0	450	0	0	450	
Fumbisi HC	390	0	0	378	0	0	390	378	
Sandema District Hospital	12,444	0	0	1,476	0	7,322	12,444	8,798	
Babile HC	0	0	0	1,638	0	0	0	1,638	
Lawra Hospital	12,942	0	0	634	0	4,204	12,942	4,838	
Total	**70,575**	**0**	**0**	**4,527**	**780**	**22,237**	**70,575**	**27,544**	
Annual Recurrent/Facility	**882**	**0**	**0**	**566**	**98**	**2,780**	**882**	**3,443**	
SDP Recurrent for System	**793,969**	**0**	**0**	**509,288**	**87,750**	**2,501,663**	**793,969**	**3,098,700**	**3,892,669**
							Total System Transport C		**5,425,414**
							Without SDPs		**1,532,745**

Storage

GHANA PUBLIC SECTOR SUPPLY SYSTEM COSTING STUDY

Storage Costs by Level

	Capital Costs			Recurrent Costs				Total Costs		
	Land	Buildings	Equipment	Labor	Other	Utilities	Supplies	Capital	Recurrent	
CMS	313,194	6,750,095	565,327	155,566	0	48,099	144,796	7,628,616	348,461	
CMS Total	313,194	6,750,095	565,327	155,566	0	48,099	144,796	7,628,616	348,461	
CMS Level Recurrent	12,528	270,004	56,533	155,566	0	48,099	144,796	339,064	348,461	**687,525**
RMS, Ashanti	51,345	1,786,629	412,387	57,835	0	13,700	6,253	2,250,361	77,788	
RMS, Central	565,123	11,781,812	336,922	88,956	1,593	1,496	601	12,683,857	92,646	
RMS, Greater Accra	24,264	734,834	115,911	91,198	3,000	3,452	2,400	875,009	100,050	
RMS, Upper East	27,005	517,427	258,138	49,919	0	11,018	8,877	802,570	69,814	
RMS, Upper West (Wa)	10,698	460,833	232,831	31,611	500	5,392	5,600	704,362	43,103	
RMS, Western Region	189,886	2,480,364	259,008	65,345	77,300	3,960	3,000	2,929,258	149,605	
Total	868,321	17,761,899	1,615,197	384,864	82,393	39,018	26,731	20,245,417	533,006	
Annual Recurrent/Facility	5,789	118,413	26,920	64,144	13,732	6,503	4,455	151,121	88,834	
Regional Level Recurrent	57,888	1,184,127	269,200	641,440	137,322	65,030	44,552	1,511,214	888,343	**2,399,558**
Bekwai District Hospital	0	59,511	13,500	54,174	6,400	6,000	4,800	73,011	71,374	
Dodowa District	0	17,521	21,678	17,424	0	2,029	1,252	39,199	20,705	
Nzema East District	0	13,579	22,315	19,344	12,144	1,094	3,024	35,894	35,606	
Total	0	90,611	57,493	90,942	18,544	9,123	9,076	148,104	127,685	
Annual Recurrent/Facility	0	604	958	15,157	3,091	1,521	1,513	1,562	21,281	
District Level Recurrent	0	12,081	19,164	303,140	61,813	30,410	30,253	31,246	425,617	**456,862**
Wa Regional Hospital	0	0	7,343	33,755	9,351	10,729	9,003	7,343	62,838	
Bolga Regional Hospital	0	0	19,063	28,352	64,444	0	0	19,063	92,796	
Tema General Hospital	0	0	26,085	69,026	35,000	3,800	5,920	26,085	113,746	
Western Regional Hospital	0	0	9,250	94,183	91	73	41	9,250	94,388	
Total	0	0	61,741	225,316	108,886	14,602	14,964	61,741	363,768	
Annual Recurrent/Facility	0	0	1,544	56,329	27,222	3,651	3,741	1,544	90,942	
Regional Hospitals Recurrer	0	0	15,435	563,290	272,215	36,505	37,410	15,435	909,420	**924,855**
Komfo Teaching Hospital	0	499,358	155,363	362,435	0	35,604	42,240	654,721	440,279	
Total	0	499,358	155,363	362,435	0	35,604	42,240	654,721	440,279	
Annual Recurrent/Facility	0	19,974	15,536	362,435	0	35,604	42,240	35,511	440,279	
Teaching Hospitals Recurrer	0	39,949	31,073	724,870	0	71,208	84,480	71,021	880,558	**951,579**
Nsuto SDP	0	9,235	2,000	12,091	60	960	1,690	11,235	14,801	
La Polyclinic HC	0	44,679	24,337	64,735	0	4,005	1,700	69,016	70,440	
Dodowa HC	0	657	2,138	7,059	500	450	140	2,795	8,149	
Shama HC	0	986	2,342	10,850	2,000	225	384	3,328	13,459	
Fumbisi HC	0	986	90	6,270	0	0	0	1,076	6,270	
Sandema District Hospital	0	3,723	4,030	19,079	4,000	2,557	6,297	7,753	31,933	
Babile HC	0	6,571	2,000	3,176	0	0	0	8,571	3,176	
Lawra Hospital	0	42,270	2,132	25,037	952	476	3,291	44,402	29,756	
Total	0	109,107	39,069	148,297	7,512	8,673	13,502	148,176	177,984	
Annual Recurrent/Facility	0	546	488	37,074	1,878	2,168	3,376	1,034	44,496	
SDP Recurrent for System	0	490,982	439,526	33,366,825	1,690,200	1,951,425	3,037,950	930,508	40,046,400	**40,976,908**
									Total for System Storage	**46,397,287**

Summary

GHANA PUBLIC SECTOR SUPPLY SYSTEM COSTING STUDY

Summary Costs

	Capital Procurement	Recurrent Procurement	Sub-Total Procurement	Capital Storage	Recurrent Storage	Sub-Total Storage	Capital Transporation	Recurrent Transporation	Sub-Total Transporation	Total Costs
CMS	14,406	124,987	139,393	339,064	348,461	687,525	123,281	192,704	315,985	**1,142,904**
RMS (10)	8,663	130,112	138,774	1,511,214	888,343	2,399,558	74,163	318,423	392,586	**2,930,918**
Districts (20)	244	60,933	61,177	31,246	425,617	456,862	121,795	138,313	260,109	**778,148**
Teaching Hospitals (2)	2,188	25,200	27,388	71,021	880,558	951,579	57,540	197,700	255,240	**1,234,207**
Regional Hospitals (10)	16,349	181,303	197,651	15,435	909,420	924,855	65,764	243,063	308,826	**1,431,333**
SDPs (900+)	96,836	1,847,700	1,944,536	930,508	40,046,400	40,976,908	793,969	3,098,700	3,892,669	**46,814,112**
Total			**2,508,920**			**46,397,287**			**5,425,414**	**54,331,621**

Glossary

Special financial terms used to categorize types of costs are used for different purposes in different situations. The terms *capital* and *operating* categorize costs as investments versus expenses or according to how ephemeral the product or service being purchased. The terms *fixed* and *variable* categorize costs according to the way the costs behave in different situations. These terms are often not mutually exclusive. For example, a capital cost, when amortized, becomes an operating cost, which is probably—although not necessarily—a fixed cost. It may also represent an opportunity cost if the item representing the capital cost could have been put to some other use.

Capital Costs and Operating (Recurrent) Costs

One way to distinguish between types of costs is to consider capital costs separately from operating (or recurrent) costs.

Capital costs are the value of acquisitions that will have a useful life in excess of one year, e.g., buildings, vehicles, equipment, etc. Usually such costs are considered as investments (or assets) and smaller items (for example, with a value of less than $500) are not included, even though they may have a useful life well in excess of one year.

Operating (or recurrent) costs are the value of services or goods that will be consumed within a one-year period, e.g., personnel (payroll and fringe benefits), gasoline, paper, utility bills, etc. More durable items with a low purchase cost are usually included in this category, e.g., staplers, office chairs, etc.

Two relationships between capital and operating costs are particularly relevant for financial analysis. First, investment through capital costs generally drives operating costs up. The construction of a building means that there will be personnel costs, utility bills, etc. The purchase of a vehicle incurs costs for a driver, gasoline, and maintenance. Second, to calculate the full costs of annual operations, both annual recurrent costs and amortized or depreciated capital costs are included.[6] Capital costs are amortized, or depreciated, over the expected life span of different categories of assets so the full capital costs of a vehicle can be spread out five years, for example.

Fixed Costs and Variable Costs

Another way to distinguish between types of costs is to consider whether they are fixed or variable.

Fixed costs remain relatively stable, or fixed, even though the volume of activity or production in an organization fluctuates up and down. Utility bills, rent, and depreciation are all usually relatively fixed costs. Fixed costs can be part of recurrent operating costs, or depreciation/amortization that is being recognized as assets. Generally, depreciation/amortization costs are fixed, unless the assets (e.g., buildings and vehicles) are sold, while many recurrent operating costs are semi-fixed.

Variable costs are costs that vary in direct relation to fluctuations in the volume of activity or production within an organization. For example, if a supply system is repackaging drugs, then the costs of packaging materials should vary in direct relationship to the volume of products being repackaged. For this study of the supply system, the throughput of commodities was considered the activity most apt to drive variable

[6] Amortization and depreciation are often used as synonyms because their purposes are similar. Depreciation is applied to an asset that will wear out, while amortization spreads a capital investment over a period of time, even if the asset (e.g., land or building) may not wear out and may even appreciate.

costs up or down based on fluctuations in throughput. However, our analysis showed that this did not appear to be the case, indicating that there were inefficiencies or irrational behavior within the system.

Many costs are semi-fixed or semi-variable, or do not behave in ways that economic theory would predict. For example, personnel costs can be relatively fixed even though they may be variable in theory, either because a skeleton staff is always required or because it is politically or administratively difficult to dismiss staff. This was considered to be the case with staff positions in Ghana's supply system. Transportation and warehousing costs are theoretically variable based on changes in the volume of commodities being handled. However, capacity constraints generally mean that these costs shift in stages, increasing when a capacity constraint is reached, or they remain fixed over a long period, even with increases in volume, because the transport system is operating below capacity.

Direct and Indirect Costs

Direct costs are costs that can be directly associated with an activity or program being studied; in this case, the logistics system at the various tiers, divided into its three functional areas. Indirect costs are costs that indirectly support the activity being studied. Such indirect costs could range from policy formulation at the central MOH level related to a national formulary to a general MOH training. As with fixed and variable costs, the division between direct cost and indirect costs is often blurred.

However, for this study indirect costs were not included. This means that the calculations of costs were more clear-cut and accurate, as the calculation and allocation of indirect costs is complex and somewhat arbitrary. In theory, the full costs of the logistics system should have included some indirect MOH costs because the system does share and benefit from more general MOH activities that have costs. In practice, however, it is highly unlikely that any general MOH activity costs would change whether the logistics system was privatized or was expanded significantly. Therefore, indirect MOH costs were not considered relevant for this study.

Marginal Costs

Marginal costs are the increase in total costs caused by increasing output by some measurable unit. In the case of the logistics system, we could think of the marginal costs created by—

- adding another tier to the system (or measure the marginal costs created by a tier that may be superfluous);
- adding another facility to a tier;
- adding another vehicle to the fleet; or,
- merging contraceptive commodities into the system at lower levels where they are currently separate.

Opportunity Costs

Opportunity costs consider the value of something that is being used in one manner would have if it could be used for some other purpose. For example, if it costs the MOH U.S.$200 to use one of its trucks to deliver commodities for one week, but the MOH could hire out one of its trucks and a driver for private use for one week for U.S.$300, then the opportunity cost of using the truck for one week is U.S.$300. With the exception of the opportunity cost of the capital invested in the pipeline, opportunity costs were not considered in this study because, apart from pipeline capital, they appeared to have little or no relevance.

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